

measuring parameter which is independent of the modulation can be supplied for example by a mechanical movement sensor. The set value can also be adjusted in dependence on the frequency, for example it can be
5 fixed during the rest state and then provided with a frequency-dependent slope.

Patent Claims

- 10 1. Cardiac pacemaker comprising a device for producing successive stimulation pulses of a median duration of the stimulation interval, a device for modulating individual stimulation intervals (ESI) and a device for detecting a cardiac function parameter and for evaluating the changes in the cardiac function parameter caused by said modulation, the stimulation interval duration being altered in dependence on the evaluated cardiac function parameter, **characterised in that**
- 15 the device for modulating the stimulation intervals (551) alternately shortens and prolongs the stimulation intervals in such a way that the respective adjusted median stimulation interval duration does not change and the evaluation device determines the electric restitution of the heart at this median stimulation interval duration on the basis of the measurement of the duration of the action potential, the changes in a measuring variable of the duration of the action potential caused by the modulation of individual stimulation intervals being determined in relation to that in the median duration of the stimulation interval and being compared with at least one set value (ERGs), and in that the median duration of the stimulation interval is controlled on the basis of said comparison.
- 20 25 30 35 2. Cardiac pacemaker according to claim 1, **characterised in that** the device for modulating

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individual stimulation intervals (ESI) carries out the alternating change repeating it periodically at intervals of a plurality of pulses.

3. Cardiac pacemaker according to claim 1,
5 **characterised in that** the device for modulating individual stimulation intervals (ESI) carries out the alternating change ($-\Delta ESI$, $+\Delta ESI$) continuously.

10 4. Cardiac pacemaker according to one of claims 1 to
3, characterised in that, as the measuring variable for determining the electric restitution, the duration of the action potential (APD) of the myocardium or the time interval between the stimulation pulse and the T wave in the ECG(ST) or the QRS complex and T wave in
15 the ECG(QT) is used.

20 5. Cardiac pacemaker according to one of claims 1 to
4, characterised in that the median value of the measuring variable (APDm, STm or QTm) determining the electric restitution is calculated over a plurality of stimulation intervals.

25 6. Cardiac pacemaker according to one of claims 1 to
5, characterised in that the changes, dependent on the respective change in the stimulation interval (AESI), of the measuring variable determining the electric restitution are stored and in that their median value ($\Delta APDm$ or ΔSTm or ΔQTm) is determined over a plurality of change cycles.

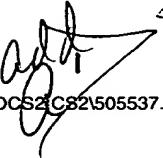
30 7. Cardiac pacemaker according to one of claims 1 to
35 **6, characterised in that**, to evaluate the change in the measuring variable, a dimensionless variable of the 25 electric restitution is used.

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8. Cardiac pacemaker according to claim 7,
characterised in that, as the dimensionless variable
of the electric restitution, the gradient of the
electric restitution (ERG) is calculated by forming
5 the quotient $\Delta APD/\Delta ESI$ or $\Delta STm/\Delta ESI$ or $\Delta QTIm/\Delta ESI$, or
the relative change in the electric restitution by
forming the quotient $\Delta APDm/APDm$ or $\Delta STm/STm$ or
 $\Delta QTm/QTm$.
- 10 9. Cardiac pacemaker according to claim 1 to 8,
characterised in that the set value(ERGs) is
predetermined by the value of the gradient or of the
relative change in the electric restitution in the 5
body's state of rest.
- 15 10. Cardiac pacemaker according to claim 5,
characterised in that, in order to adapt the set value
(ERGs) to individual fluctuations in the electric
restitution, the median duration of the stimulation
interval is fixed by external programming in the
patient's state of rest and the value measured in this
rest phase is stored as an absolute set value (ERGs).
11. Cardiac pacemaker according to claim 9,
25 **characterised in that**, in order to adapt the set value
15 (ERGs) to longer-term fluctuations of the electric
restitution, the rest state of the patient is
recognised by means of a sensor and the median
duration of the stimulation interval is adjusted and
30 the stored set value (ERGs) is replaced by the value
measured in the detected rest phase.
12. Cardiac pacemaker according to one of claims 1 to
9, **characterised in that**, to compensate for the
35 frequency-dependent changes in the detection of the T
waves, the set value (ERGs) is altered in dependence
on 25 the duration of the stimulation interval.

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13. Cardiac pacemaker according to one of claims 1 to
8, **characterised in that** the median duration of the
stimulation interval is controlled in such a way that
it rises if the difference between the restitution 30
5 gradient and the set value falls below a negative
threshold value and drops if the difference exceeds a
positive threshold value.


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